Septic Tank

العربية (/ar/sanitation-systems/sanitation-technologies/septic-tank)

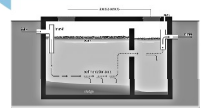
Applicable to
System 6 (/humanitarian-crises/rural-settings/sanitation/sanitation-systems/system-6%3A-blackwater-treatment-system-with-infiltration)
System 7 (/humanitarian-crises/rural-settings/sanitation/sanitation-systems/system-7%3A-blackwater-treatment-system-with-effluent-transport)

Application level
- City
- Household
- Neighborhood

Management level
- Household
- Public
- Shared

Inputs
Blackwater | Brownwater | Greywater

Outputs
Sludge | Effluent



Author/Compiled by
Eawag (Swiss Federal Institute of Aquatic Science and Technology)
Dorothee Spuhler (seecon international gmbh)

Adapted from

Compendium of Sanitation Systems and Technologies. 2nd Revised Edition (/node/5587)

Executive Summary

A septic tank is a watertight chamber made of concrete, fibreglass, PVC or plastic, through which blackwater and greywater flows for primary treatment. Settling and anaerobic processes reduce solids and organics, but the treatment is only moderate.

Advantages

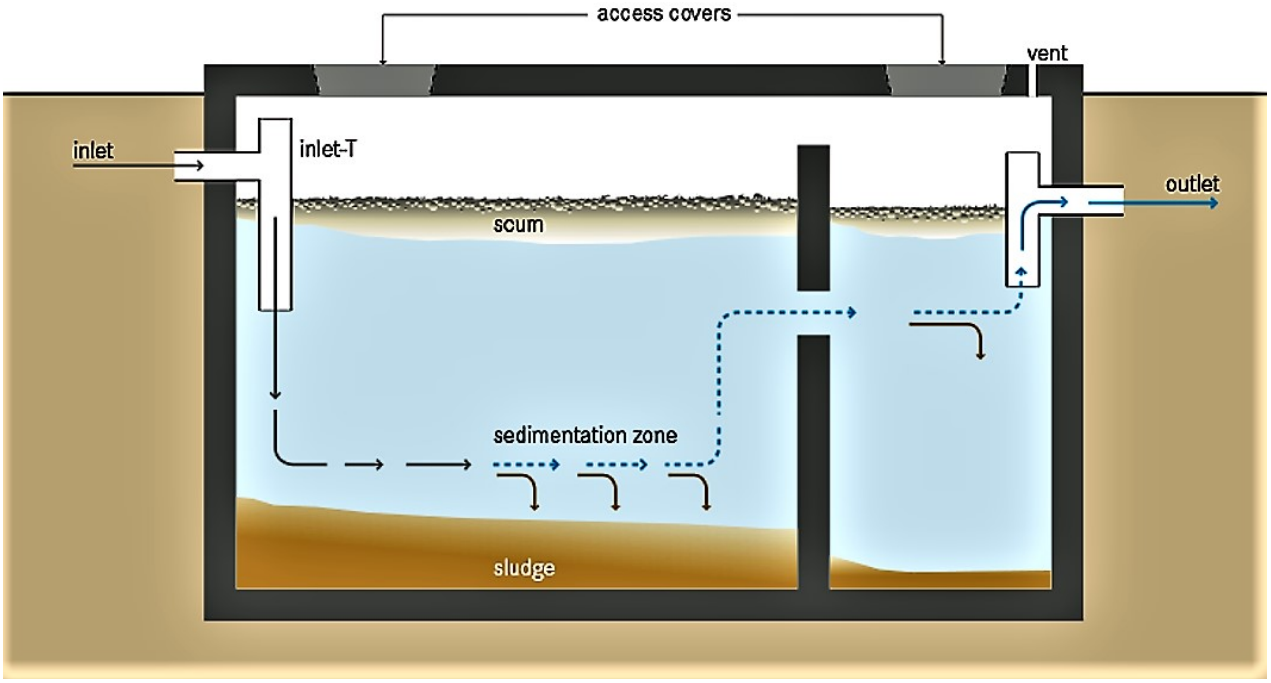
Disadvantages

- Simple and robust technology
- No electrical energy is required
- Low operating costs
- Long service life
- Small land area required (can be built underground)
- Low reduction in pathogens, solids and organics
- Regular desludging must be ensured
- Effluent and sludge require further treatment and/or appropriate discharge

In	Out
Blackwater, Brownwater, Greywater	Blackwater (settled, Effluent), Faecal Sludge, (Biogas)

Introduction

Liquid flows through the tank and heavy particles sink to the bottom, while scum (mostly oil and grease) floats to the top. Over time, the solids that settle to the bottom are degraded anaerobically. However, the rate of accumulation is faster than the rate of decomposition, and the accumulated sludge and scum must be periodically removed. The effluent of the septic tank must be dispersed by using a **soak pit (/factsheet/soak-pits)** or **leach field (/factsheet/leach-fields)**, or transported to another treatment technology via a **solids-free sewer (/factsheet/solids-free-sewer)**.Generally, the removal of 50% of solids, 30 to 40% of BOD and a 1-log removal of E. coli can be expected in a well-designed and maintained septic tank, although efficiencies vary greatly depending on operation and maintenance and climatic conditions.



Schematic of a septic tank. Source: TILLEY et al. (2014)

Design Considerations

A septic tank should have at least two chambers. The first chamber should be at least 50% of the total length, and when

there are only two chambers, it should be two thirds of the total length. Most of the solids settle out in the first chamber. The baffle, or the separation between the chambers, is to prevent scum and solids from escaping with the effluent. A T-shaped outlet pipe further reduces the scum and solids that are discharged.

Accessibility to all chambers (through access ports) is necessary for maintenance. Septic tanks should be vented for controlled release of odorous and potentially harmful gases.

The design of a septic tank depends on the number of users, the amount of water used per capita, the average annual temperature, the desludging frequency and the characteristics of the wastewater. The retention time should be 48 hours to achieve moderate treatment. The retention time should be 48 hours to achieve moderate treatment.

A variation of the septic tank is called an Aquaprivy. This is a simple storage and settling tank that is located directly below the toilet so that the excreta fall into it. The Aquaprivy has a low treatment efficiency.

Health Aspects/Acceptance

Under normal operating conditions, users do not come in contact with the influent or effluent. Effluent, scum and sludge must be handled with care as they contain high levels of pathogenic organisms.

Users should be careful when opening the tank because noxious and flammable gases may be released.

Operation & Maintenance

Because of the delicate ecology, care should be taken not to discharge harsh chemicals into the septic tank. Scum and sludge levels need to be monitored to ensure that the tank is functioning well. Generally, septic tanks should be emptied every 2 to 5 years. This is best done by using a **motorized emptying and transport technology (/factsheet/motorised-emptying-and-transport)**, but **human-powered emptying (https://sswm.info/water-nutrient-cycle/wastewater-collection/hardwares/cartage/human-powered-emptying-and-transport)** can also be an option.

Septic tanks should be checked from time to time to ensure that they are watertight.

Applicability

This technology is most commonly applied at the household level. Larger, multi-chamber septic tanks can be designed for groups of houses and/or public buildings (e.g., schools).

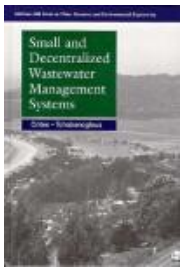
A septic tank is appropriate where there is a way of dispersing or transporting the effluent. If septic tanks are used in densely populated areas, onsite infiltration should not be used, otherwise, the ground will become oversaturated and contaminated, and wastewater may rise up to the surface, posing a serious health risk. Instead, the septic tanks should be connected to some type of conveyance technology, through which the effluent is transported to a subsequent treatment or disposal site. Even though septic tanks are watertight, it is not recommended to construct them in areas with high groundwater tables or where there is frequent flooding.

Because the septic tank must be regularly desludged, a vacuum truck should be able to access the location. Often, septic tanks are installed in the home, under the kitchen or bathroom, which makes emptying difficult.

Septic tanks can be installed in every type of climate, although the efficiency will be lower in colder climates. They are not efficient at removing nutrients and pathogens.

Library References

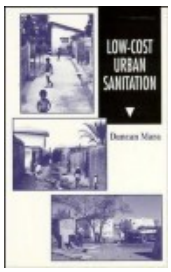
Small and Decentralized Wastewater Management Systems



Decentralised wastewater management presents a comprehensive approach to the design of both conventional and innovative systems for the treatment and disposal of wastewater or the reuse of treaded effluent. Smaller treatment plants, which are the concern of most new engineers, are the primary focus of this book.

CRITES, R. TCHOBANOGLOUS, G. (1998): Small and Decentralized Wastewater Management Systems. New York: The McGraw-Hill Companies Inc

Low-cost Urban Sanitation



This book covers the public health, technical, socioeconomic, sociocultural and institutional aspects of sanitation in towns and cities of developing countries. The text features excreta-related diseases and the use of sanitation to reduce their transmission. The sanitation technologies covered in detail are VIP latrines, pour-flush toilets, septic tanks, settled sewerage and simplified sewerage, with additional chapters on sullage disposal, pit emptying, and sewage treatment and reuse. Sociocultural constraints on sanitation systems and their socioeconomic costing are described, together with hygiene education, which is essential in order to achieve maximum benefits to health. The text also explains how to choose the most appropriate sanitation option for a given low-income community. Finally, institutional aspects are reviewed, including effective sanitation programme planning, monitoring and evaluation.

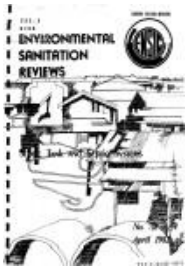
MARA, D. (1996): Low-cost Urban Sanitation. United Kingdom: Wiley

Septic Tank Guidelines

This document on septic tanks gives guidelines on how to design and make a system.

OXFAM (2008): Septic Tank Guidelines. (= Technical Brief). Oxford: OXFAM **URL (http://policy-practice.oxfam.org.uk/publications/septic-tank-guidelines-126711)** [Accessed: 08.04.2014]

Septic Tank and Septic Systems



This paper presents a review on the septic tank and septic systems. Information on design and functional aspects, and environmental effects of septic tank systems are presented.

POLPRASERT, C. RAJPUT, V.S. (1982): Septic Tank and Septic Systems. (= Environmental Sanitation Reviews , 7). Bangkok: Environmental Sanitation Information Center **URL (http://www.irc.nl/docsearch/title/107733)** [Accessed: 08.04.2014]